1976 Insect Control Guide

FIELD and FORAGE CROPS

Pest Management

Insects and related pests play a major role in field crop production in Illinois. Although agronomic practices developed during the past century have reduced the importance of some insect pests, they have increased the importance of others. In addition a number of new insect invaders also threaten grain and forage production. Agronomic practices such as certain tillage operations, destruction of crop residues, selection of resistant hybrids, adjustment of planting dates, rotation of crops, etc., if used properly, still serve to help suppress insect populations. Where possible, these practices continue to be used to provide more balanced insect control.

Practical applications of many insect-control techniques continue to be thoroughly investigated. Such control methods as insect sterilization, insect growth regulators, release of insect parasites and predators, attractants for insect baits and traps, propagation and dissemination of insect disease organisms, as well as the use of insecticides, are being vigorously pursued. Despite the most optimistic reports, however, it is readily apparent that insecticides will be an important part of pest management for many years to come.

Insecticides

These suggestions for the use of insecticides are based on available data. Soil texture, soil pH, rainfall, slope of the field, wind velocity at planting, and other unpredictable factors affect the efficiency. Please report control failures and the circumstances associated with such failures to us.

Requested label clearances for a few uses of some insecticides, carriers, and solvents are uncertain for 1976, since many requests have not yet been officially cleared. Anticipating needed changes in labeling, we began modifying these suggested uses a few years ago. We have attempted to anticipate any further label changes in 1976, but an occasional use may still be canceled. Be sure to check with your county extension adviser if you are in doubt about the insecticide you plan to use. We will make announcements of label changes through the news media to keep you up to date.

The chemical names referred to in this circular may be unfamiliar to you. These names are the common coined chemical names and as such are not capitalized (for example, terbufos). Trade names are capitalized (for example, Counter). In the table of limitations, the trade names are listed first, and the common name is in parentheses following the trade name. However, in the tables of suggestions, the trade name is used if there is one. In case of question, refer to the following list or to the table of limitations:

Trade name	Common name
Counter	terbufos
Cygon	dimethoate
Dasanit	fensulfothion
diazinon	diazinon
Dibrom	naled
Di-Syston	disulfoton
Dyfonate	fonofos
Dylox	trichlorfon
ethyl parathion	ethyl parathion
Furadan	carbofuran
Guthion	azinphosmethyl
Imidan	phosmet
Lannate	methomyl
Lorsban	chlorpyrifos
malathion	malathion
methoxychlor	methoxychlor
methyl parathion	methyl parathion
Mocap	ethoprop
Sevin	carbaryl
Supracide	methadathion
Systox	demeton
Thimet	phorate
toxaphene	toxaphene
Trithion	carbophenothion

Pesticide Safety

Certain precautionary steps should be taken when handling insecticides. Some of the insecticides suggested in the publication can be poisonous to the applicator. The farmer is expected to protect himself, his workers, and his family from needless exposure.

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
In cooperation with ILLINOIS NATURAL HISTORY SURVEY
COLLEGE OF AGRICULTURE
CIRCULAR 899
COOPERATIVE EXTENSION SERVICE
Urbana, Illinois, December, 1975

When using insecticides, apply all the scientific knowledge available to insure that there will be no illegal residue on the marketed crop. Such knowledge is condensed on the label. Read it carefully and follow the instructions. But the label should be recent and not from a container several years old. Do not exceed maximum rates suggested; observe carefully the interval between application and harvest; and apply only to crops for which use has been approved. Make a record of the product used, the trade name, the percentage content of the insecticide, dilution, rate of application per acre, and the date or dates of application.

Always handle insecticides with respect. The persons most likely to suffer ill effects from insecticides are the applicator and his family. Accidents and careless, needless overexposure can be avoided. Here are a few rules that if followed will prevent most insecticide accidents:

1. Wear rubber gloves when handling insecticide concentrates.
2. Do not smoke while handling or using insecticides.
3. Keep your face turned to one side when opening, pouring from, or emptying insecticide containers.
4. Leave unused insecticides in their original containers with the labels on them.
5. Store insecticides out of reach of children, irresponsible persons, or animals; store preferably in a locked building. Do not store near livestock feeds. Better yet, buy no more pesticide than you will use. This eliminates a pesticide storage and disposal problem.
6. Wash out and bury, burn, or haul to the refuse dump all empty insecticide containers.
7. Do not put the water-supply hose directly into the spray tank.
8. Do not blow out clogged nozzles or spray lines with your mouth.
9. Wash with soap and water exposed parts of body and clothes contaminated with insecticides.
10. Do not leave puddles of spray on impervious surfaces.
11. Do not apply to fish-bearing or other water supplies.
12. Do not apply insecticides, except in an emergency, to areas with abundant wildlife.
13. Do not apply insecticides near dug wells or cisterns.
14. Do not spray or dust when weather conditions favor drift.
15. Observe all precautions listed on the label.
16. To avoid bee kill, apply insecticides after bee activity has been completed for the day; use the least toxic materials. *Warn beekeepers that you are applying insecticides.*

SPECIAL SUGGESTIONS AND MAJOR CHANGES FOR 1975

Federal and State Laws

Currently, the U.S. Environmental Protection Agency is classifying pesticides according to general and restricted use as required by the passage of the Federal Environmental Pesticide Control Act of 1972. By October of 1976, anyone applying a restricted-use pesticide must be certified. *Commercial* applicators who apply restricted-use pesticides will be certified; *private* applicators who use restricted-use pesticides "for the purpose of producing any agricultural commodity on property owned or rented by him or as exchange labor (no compensation) on the property of another will need to be certified." Commercial applicators will include not only the person applying a pesticide for hire but also governmental personnel, chemical company representatives, and others involved in demonstrational, regulatory, and public health pest control. Certification as a commercial applicator will require the passage of a written examination administered by either the Illinois Department of Agriculture or the Department of Public Health.

Educational training programs for farmers (private applicators) and commercial pesticide applicators will be conducted by the Cooperative Extension Service to prepare persons for certification as pesticide applicators early in 1976. For additional information, consult your county extension adviser. The actual certification and issuing of permits or licenses will be handled by the Illinois Department of Agriculture or the Department of Public Health.

Illinois law now permits a farmer to apply any pesticide to his own farm and the farms of two others without being a licensed applicator. A commercial applicator applying pesticides for hire outside a structure must be licensed under Illinois law.

Insecticide Restrictions in Illinois

The chlorinated hydrocarbons — aldrin, chlordane, dieldrin, endrin, heptachlor, and lindane — cannot be used on dairy farms except around the farm residence. This ruling was adopted by the Illinois Department of Public Health in 1971 at the recommendation of the Interagency Committee on the Use of Pesticides. The use of DDT in Illinois is banned except where special permits are obtained from the Illinois Department of Agriculture or the Department of Public Health.

The U.S. Environmental Protection Agency has suspended the manufacture of aldrin and dieldrin for agricultural purposes. Existing supplies may be sold and used.

Because of insect resistance, possible insecticide resi-

dues in crops, livestock, and livestock products, and limited yield returns, we strongly advise against the use of aldrin, chlordane, dieldrin, endrin, heptachlor, and lindane in Illinois. All three corn rootworm species, seed-corn beetles, seed-corn maggots, and possibly wireworms and white grubs are no longer effectively controlled by these insecticides.

Farmers are cautioned to omit the use of aldrin, heptachlor, or chlordane for one crop year before growing soybeans in a field.

Suggestions for Insect Control in 1976

Predicting Need for Soil Insecticides on Corn

Many farmers in Illinois will not have a soil-insect problem on corn in 1976. The type of crop rotation influences to a great extent whether a soil-insect problem will occur and the kind. Following are some guidelines for predicting soil-insect problems in corn and determining the need for using a soil insecticide at planting time. These guides are based on demonstrational tests and research. Exceptions can be expected occasionally since soil-insect problems are influenced by a variety of conditions unrelated to crop rotation — weather, soil type, planting date, hybrid, tillage, natural enemies, and others. Knowledge of soil-insect damage in a particular field in previous years is also helpful, since infestations tend to occur in the same fields and in the same area.

Corn After Soybeans

The potential for soil-insect problems in corn following soybeans is generally low. Soil insecticides are seldom necessary. There are a few exceptions. *Corn rootworms* may occasionally be a problem when beetles deposit their eggs in soybean fields that contain volunteer corn, which when planted to corn the following year may have economic damage. Rootworm beetles will feed on the foliage of soybean plants, and they are especially attracted into soybean fields that are weedy and contain volunteer corn. Using a herbicide or clean cultivation will reduce the attractiveness of soybean fields to rootworm beetles. Clean fields of soybeans will permit soybean-corn rotations with no damage from corn rootworms. *Black cutworms* may be a problem in corn where excess soybean plant debris remains on the soil surface following chisel-plowing. *White grubs* are an occasional problem in east-central Illinois in corn after soybeans. In most fields of corn after soybeans, a diazinon planter-box seed treatment will be adequate to protect against attack by seed-corn beetles and seed-corn maggots.

Corn After Corn

The potential for rootworm damage is moderate to severe in the northern half of Illinois, and a rootworm insecticide may be needed in fields of continuous corn. Wireworms are occasionally a problem in southern areas. See discussions under rootworms and wireworms.

Corn After Grass Sod

Wireworms and white grubs are potential problems. Apply a soil insecticide at planting time.

Corn After Clover and Alfalfa

Grape colaspis, grubs, wireworms, and cutworms are potential problems. Rootworms may be a problem in northern Illinois in corn following clover or alfalfa. Apply a soil insecticide at planting time.

Corn After Small Grain

There is a slight potential for damage by wireworms, seed-corn beetles, and seed-corn maggots. In most instances, a diazinon planter-box seed treatment will be adequate. If wireworms are present, use a soil insecticide at planting.

Corn Rootworms

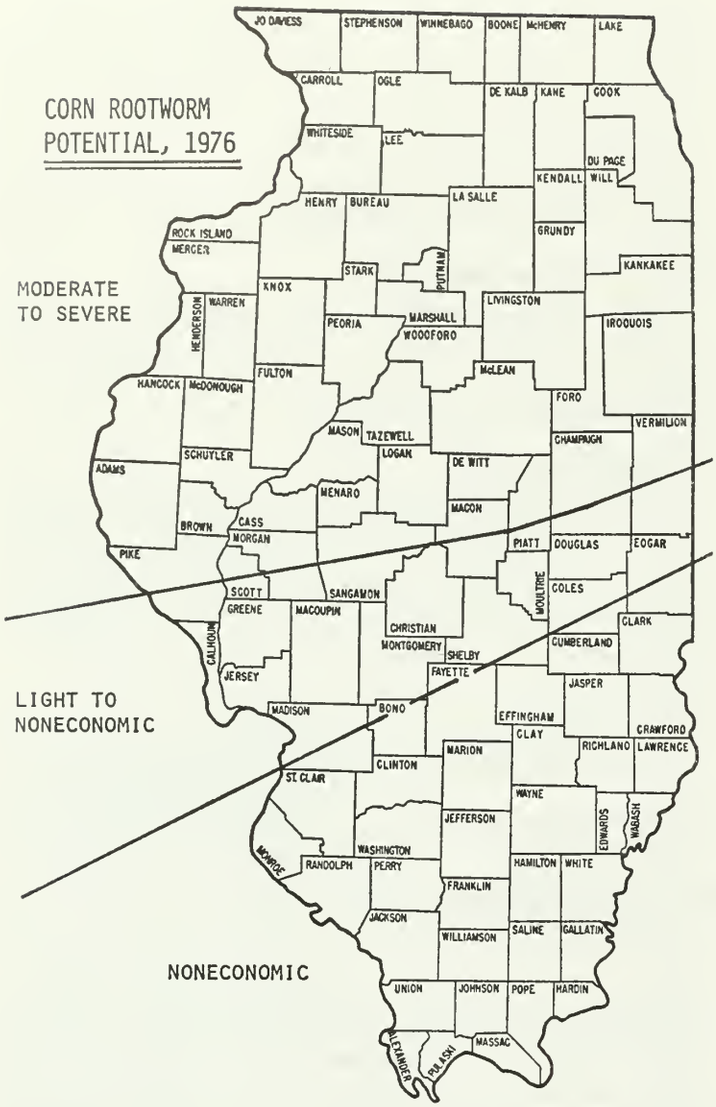
Rootworm Situation, 1976. In 1976, moderate to severe rootworm damage may occur in many fields of corn following corn in the area north of a line from Pittsfield to Decatur to Danville (see map). The potential for rootworm damage in the area north of Interstate 80 is very high. Light to moderate damage may occur in an occasional field of continuous corn north of a line from Collinsville to Paris. The potential for damage by northern and western corn rootworms south of this line is very low.

A survey of northern and western corn rootworm beetle populations in cornfields in August, 1975, showed populations were high in northwestern Illinois and moderate in northeastern, central, western, and eastern Illinois. Populations were noneconomic in the southern third of Illinois.

The abundance of rootworm beetles in cornfields during August 1975, can be used to predict the potential for rootworm damage in 1976. Corn growers in the problem areas should base the need for using a soil insecticide on the presence of rootworm beetles observed feeding on silks in cornfields during August, 1975. Lodging or elbowing is also an indicator of rootworm damage.

Rootworm beetles deposit their eggs in the soil around the base of the corn plants or between the rows during August and September. If rootworm beetles averaged less than 1 per plant, or were absent in fields last August, the potential for damage is low, and a soil insecticide will not be needed. An average of 1 or more beetles per plant in August indicates a problem, and a soil insecticide should be used if the field is replanted to corn in 1976.

Reasons for Rootworm Problems in 1975. Severe



rootworm damage occurred in some fields treated with organic phosphate and carbamate soil insecticides in northwestern and central Illinois during 1975. Why didn't the insecticides give good control? There were several factors — usually several in combination.

Fields of corn planted late in 1974 attracted many beetles in late August and September, resulting in more rootworm eggs than normal.

Early planting of fields in 1975 allowed the soil insecticides more time to break down before rootworm eggs hatched. The insecticides control the larvae, not the eggs. Heavy June rains in some areas caused the organic phosphate and carbamate insecticides to break down sooner. Alkaline soils, or those with a pH of 7 or higher, favor rapid degradation of insecticides and reduce their effectiveness. Dry weather in July prevented or reduced root regeneration after rootworm damage. Root systems of corn plants were shallow early in the season, and when rains and winds hit in August, lodging resulted in fields damaged by rootworms. Insecticide rates were too low in some fields. Tillage practices of dragging the field after planting may have moved the insecticide band off the row, resulting in poor rootworm control. Insecticide granules not incorporated with a press wheel or drag chain are broken down more rapidly by sunlight.

Insect resistance to the organic phosphate and carbamate insecticides may be a factor. Laboratory tests show that it took slightly more insecticide to kill the rootworm beetles in 1975 than it did in 1972. Although these data on resistance are not conclusive, they are a warning sign for the future. Rootworm resistance to soil insecticides may occur in the next few years.

In summary, climatic conditions favorable to the rootworm were probably a major factor in higher rootworm populations and accompanying damage in 1975. The soil insecticides which normally give 60 to 80 percent control were inadequate against these heavy infestations.

Rootworm Control With Insecticides. There are some uncertainties about the performance of rootworm insecticides in 1976. Our suggestions for chemical rootworm control are based on 1975 research data at Illinois and other experiment stations. These data are highly variable. There were trials in which an insecticide gave good rootworm control in one location but was ineffective in another.

Counter or Furadan should provide good to excellent control of rootworm infestations (see table). Thimet should give fair to good control. Dyfonate, Lorsban, and Mocap-C (coated formulation) are expected to give fair control. Use the highest labeled rate for rootworms. In research trials the coated or slow-release formulation of Mocap has given slightly better control of rootworms than the regular formulation.

Liquid formulations of Furadan 4-F and Dyfonate 4-E may be mixed with water or liquid fertilizer and applied as a spray. Liquid formulations should be applied

Insecticides Suggested for Rootworm Control at Planting, 1976

Performance[a]	Insecticide	Pounds of product per acre		
		40″ rows	38″ rows	30″ rows
Good-Excellent	Counter 15G	6.5	7.0	8.7
Good-Excellent	Furadan 10G[b]	10.0	10.5	13.3
Fair to Good	Thimet 15G[b]	6.5	7.0	8.7
Fair	Dyfonate 20G[b]	5.0	5.3	6.7
Fair	Lorsban 15G	6.5	7.0	8.7
Fair	Mocap-C[c] 10G	10.0	10.5	13.3

[a] Based on research data using root ratings and yield as criteria at 4 locations in Illinois during 1975.
[b] Failures occurred with these products in some fields in 1975.
[c] Coated or slow-release formulation.

with a split-boot applicator or as a 7-inch band ahead of the press wheel. *Use caution when handling liquid formulations.* They are more toxic than granular formulations. Broadcast applications are not cleared for rootworm control.

Other Rootworm Control Alternatives. Here are several alternatives to using insecticides.

1. A crop rotation is an effective method of preventing or reducing corn rootworm damage. Farmers who had damage in 1975 should consider rotating to another crop in 1976. If practical, do not grow corn two years in succession in the same field. All research to date indicates that corn following soybeans and small grains is not likely to have rootworm damage. Exceptions might be soybean fields with volunteer corn or small-grain fields that are allowed to grow to weeds. Corn planted in these fields the following year may benefit from insecticide treatment. Corn following alfalfa may also benefit from treatment since rootworm beetles may deposit their eggs during the bloom stage of alfalfa in August.

2. Fields that were planted June 1 or later in 1975 are likely to have high numbers of rootworm eggs, which were deposited by beetles last August and September. It is best to plant such fields to a crop other than corn. Fields with five or more beetles per corn plant in August should be planted to a crop other than corn in 1976, or treated with Furadan or Counter.

3. Fall or spring moldboard plowing and increased tillage on land not subject to erosion may help to kill rootworm eggs. Avoid using *only* a chisel plow, or disk.

4. If a sweet corn or silage field was harvested before August 10, 1975, no soil insecticide is needed if the field is planted to corn in 1976.

5. Select a variety that has good standability and root regeneration or rerooting capability.

6. Apply a cultivator treatment at lay-by time using Furadan, Thimet, Dyfonate, or Mocap if you find 3 or more larvae per plant in untreated fields.

7. Plant last those fields believed to be heavily infested. As compared with early planting, this will minimize breakdown of the soil insecticide before egg-hatch starts.

8. Cornfields averaging less than 1 rootworm beetle per plant in August, 1975, can be planted to corn in 1976 with no need for a soil insecticide.

9. Rotation of insecticides is an unproven alternative. If an insecticide gave poor rootworm control last year, it may be advantageous to switch from an organic phosphate to a carbamate, or vice versa.

10. Controlling beetles with aerial applications of insecticides applied in mid-August may help to prevent or reduce damage the following year. We suggest this not as a replacement for, but in addition to, granular insecticide treatments at planting time. Present research indicates that two aerial applications of insecticides properly timed during August are necessary to eliminate damage the following year.

Use Scouting to Predict Rootworm Problems. The presence or absence of rootworm beetles in a corn field is an excellent indicator of future problems. Corn growers can determine the potential for rootworm damage in 1977 by counting western and northern corn rootworm beetles between August 1 and 25, 1976 in this way:

1. Collect the western and northern corn rootworm beetles from the tips of 50 ears at two different times about 7 to 10 days apart between August 1 and 25. It will take about 30 minutes to make your collections in a 40-acre field.

2. To collect your sample, clasp the ear tip and silks tightly in one hand; cut off the silks at the ear tip with a sharp knife, and place the silks in a plastic bag 6 inches by 12 inches. Keep the bag tightly closed to prevent the beetles from escaping.

3. Collect 50 ear tips at random throughout the field. Avoid sampling along the field edges. Approach plants slowly to avoid disturbing the beetles.

4. Place the plastic bag in a freezer for about one hour to immobilize the beetles. Then spread the contents on a newspaper and count the number of beetles on the 50 ear tips.

5. Fields averaging less than 1 rootworm beetle per plant in August, 1976, can be planted to corn in 1977 without a soil insecticide treatment. If the average is 1 or more beetles per plant for sampling date, plan to apply a rootworm insecticide in 1977.

Wireworms

A check can be made for wireworms before planting by placing baits in the soil at six locations in a field. The baits should be placed in a hole about 3 to 6 inches below the soil surface around April 1. Place two baits at the highest field elevation, two on the slope, and two at the lowest area. Use a mixture of 1 cup of wheat and 1 cup of shelled corn at each bait station. Cover the bait with soil and mark the locations with a flag or stake. In 10 to 14 days, dig up the baits and examine for wireworm larvae. Overwintering wireworms are attracted to the baits. If there is an average of 1 wireworm per bait station, use an insecticide. Apply Furadan or Counter in the furrow, or Thimet, Dasanit, Dyfonate, or Mocap in a 7-inch band ahead of the press wheel. Many fields in Illinois will contain an occasional wireworm larva, but most fields will not have any, or at most 1 or 2 worms on six bait traps. For these, no treatment is recommended.

Black Cutworms

The best current methods of cutworm control are to apply a 5% Sevin-apple pomace pelletized bait or sprays of Sevin or Dylox at the first sign of cutworm damage. The pelletized bait should be broadcast on the surface of the soil; the sprays should be banded over the row. When plants are beginning to emerge, check fields of corn for signs of cut, wilting, or missing plants. Small cutworm larvae will feed on the leaves, and do not begin cutting plants until they are half grown. Fields that are most likely to have cutworm damage have the following characteristics:

A previous history of cutworm injury
Considerable surface debris
Chisel-plowed or reduced tillage
Poorly drained
Were in soybeans last year

Planter-Box Seed Treatments

A diazinon planter-box seed treatment will protect against attack by seed-corn beetles and maggots during germination. If one of the organic phosphate insecticides is not applied at planting, consider using the seed-treatment as minimum protection. The seed treatment is not needed if Counter, Dasanit, Dyfonate, Lorsban, Mocap, or Thimet is applied at planting. Use a seed treatment when Furadan, heptachlor or chlordane is applied at planting. Seed-corn beetles and maggots are resistant to heptachlor and chlordane. The diazinon planter-box seed treatment may interfere with the monitor in air planters. Some loss of the seed treater will also occur with these planters.

No-Till Corn

Soil insecticides can be profitably applied to corn following grass sod, or in any rotation in which grasses and weeds are prevalent. In no-till corn research trials, Furadan has controlled armyworms, billbugs, and flea beetles and has suppressed common stalk borers, first-generation European corn borers, wireworms, and white grubs when applied at 2 pounds active ingredient per acre at planting time in the furrow or as a 7-inch band ahead of the press wheel. Lower rates of Furadan are less effective against this insect complex, but may give better results than other soil insecticides. Based on these data, growers with a no-till corn program may wish to apply Furadan at planting time.

On no-till corn following corn (except in the rootworm area), soybeans, or a small grain, it does not generally pay to apply a soil insecticide. However, a diazinon seed treatment should be used.

Thimet, Dasanit, Dyfonate, Counter, Mocap, and Furadan will give some control of wireworms and white grubs in no-till corn planted in grass sod.

Alfalfa Weevil

In 1976 we expect alfalfa weevils to cause moderate to severe damage to the first cutting of alfalfa in all areas of Illinois. Last year extensive damage occurred south of Interstate 80. Growers should inspect alfalfa fields closely during April and May for signs of weevil damage.

FIELD CORN

Insect	Time of attack	Insecticide[1]	Lb. active ingredient per acre	Placement	Timing of application (See table of limitations, page 11)
Corn rootworm	June-August	Counter	1*	7-inch band	Apply ahead of planter press wheel. For moderate to severe infestations, 1 pound of Furadan or Counter is most effective. Basal treatments during cultivation with Furadan, Dyfonate, Thimet, or Mocap are effective.
		Furadan	1*		
		Thimet	1*		
		Dyfonate	1*		
		Lorsban	1*		
		Mocap-C	1*		
Seed-corn beetle	At germination	diazinon	1½ oz. per bu. of seed	On seed	Or as a band treatment, use Dasanit, Dyfonate, or Thimet.
Seed-corn maggot	At germination	diazinon	1½ oz. per bu. of seed	On seed	Or apply Counter in the furrow or band treatments of Dasanit or Dyfonate.
Wireworm	May-June	Counter	1*	furrow	Counter and Furadan should be applied in the furrow. All others as a 7-inch band ahead of the press wheel. If infestations are severe, control may not be satisfactory.
		Dasanit	1*	7-inch band	
		Dyfonate	1*	7-inch band	
		Furadan	2*	furrow	
		Mocap	1*	7-inch band	
		Thimet	1*	7-inch band	
White grub Grape colaspis	May-October May-June	The soil insecticides suggested for wireworms will give partial control of white grubs and grape colaspis. Furadan and Counter should be applied in the seed furrow and the other insecticides in a 7-inch band ahead of the press wheel.			
Sod webworm	May-June	Sevin	1	At base of plant	At time of initial attack.
Cutworms	May-June	Sevin bait	1	Broadcast	When feeding starts. Repeat if needed.
		Sevin plus molasses or Tractum	2	Direct at base of plant	Same as above. Use 1 quart of molasses per acre. Apply in the spray mix.
		Dylox spray	1	At base of plant	When feeding starts.
Billbug	May-June	Sevin	1	At base of plant	Apply sprays as needed.
		diazinon	1		
Garden symphylan	May-July	Dyfonate	1 at planting 2 before planting	7-inch band Broadcast	Before planting, lightly incorporate.
Grasshopper	June-September	Sevin	¾	Over row as spray	As needed. For ensilage corn use Sevin, diazinon, or malathion.
		toxaphene	1½		
		diazinon	½		
		malathion	1		
Flea beetle	May-June	Sevin	¾	Over row as spray	When damage becomes apparent on small corn.
		toxaphene	1½		
Armyworm	May-June	Sevin	1½	Over row as spray	At first migration or when damage first becomes apparent.
		malathion	1		
		toxaphene	1½		
		Dylox	1		
	Late July, August	toxaphene	1½	Broadcast	When leaves below ear level are consumed and worms eating leaves above ear level.
Fall armyworm	June; August-September	Sevin	1½	In whorls	Granules preferred when worms deep in whorl. If worms are small and out on leaves, sprays will be satisfactory. When silking, see suggestions for corn earworm.
		diazinon	1		
		Dylox	1		
		toxaphene	1½		
Chinch bug	June-August	Sevin	1	Spray at base of plant	At start of migration. If applied in adjacent small grain, do not harvest.
Thrips	June	Sevin	1	On foliage as spray	When severe wilting and discoloration are noticed.
		malathion	1		
Corn leaf aphid	July-August	diazinon granules	1	In whorl	Just before tasseling when aphids are appearing on individual plants. Preventive treatment. Not after tassel emerges. For seed fields only and not if field is to be detasseled by hand.
		Thimet granules	1		
		malathion	1	As a foliage spray	Apply during late whorl to early tassel when 50% of the plants have light to moderate infestations.
		diazinon	1		

[1] See page 11 for insecticide restrictions.
* Based on 40-inch row spacing. Increase rates for narrow rows.

FIELD CORN (continued)

Insect	Time of attack	Insecticide[1]	Lb. active ingredient per acre	Placement	Timing of application (See table of limitations, page 11)
Corn rootworm adults	Late July, early August	Sevin malathion diazinon	1 1 1	Overall spray or directed towards silk	When silking is not over 50% and there are more than an average of 5 beetles per ear. Only to protect pollination.
Corn earworm	July-August	Sevin	1½	Spray ear zone	2 applications at 3- to 5-day intervals, starting at 30-50% silk. Use 25 gal. of finished spray per acre.
Corn borer, first generation	June-July	Sevin granules diazinon granules	1½ 1	On upper ⅓ of plant and into whorl	When tassel ratio is 30 to 50, and 50% or more plants show recent borer feeding in whorl.
Corn borer, second generation	Mid-August	Sevin diazinon	1½ 1	From ear upward	Use spray or granules. At first hatch when there are 1 or more egg masses per plant.
Southwestern corn borer	August	Furadan	1	From ear upward	Direct granules into whorls. Apply when 25% of plants have egg masses or larvae on leaves. Early-planted corn usually escapes damage.

[1] See page 11 for insecticide restrictions.

STORED GRAIN (Corn, Wheat, and Oats)[1]

Insect	Time of attack	Insecticide and dilution	Dosage	Placement	Suggestions (See table of limitations, page 11)
Angoumois grain moth (earcorn)	April-October (southern ⅓ of Illinois only)	malathion 57% E.C., 3 oz. per gal. water	Apply to runoff	Spray surface and sides May 1 and August 1	Plant tight husk varieties. Store as shelled corn to avoid all but surface damage by angoumois moth.
Meal moths and surface infestations only[2]	April-October	dichlorvos 20% (DDVP, Vapona) plastic resin strip[3]	1 per 1,000 cu. ft. space above grain mass	Attach to ceiling or side wall	Clean and spray bin with 1.5% malathion to runoff before storage. Store only clean dry grain. Install June 1 or at storage. Replace in mid-August.
		pyrethrin 6% + piperonyl butoxide 60% E.C., 4½ oz. per gal. water	2 gal. per 1,000 sq. ft.	Spray grain surface, bin walls, and ceiling	Clean and spray bin with 1.5% malathion to runoff before storage. Store only clean dry grain. Apply June 1 or at storage and monthly thereafter during summer months.
General					
Internal and external feeders Rice and granary weevils Flat grain beetle Saw-toothed grain beetle Rusty grain beetle Foreign grain beetle Cadelle beetle Flour beetle	April-October	malathion 57% E.C., 1 pt. per 3-5 gal. water[4]	3-5 gal. per 1,000 bu.	Spray uniformly as grain is binned	Clean and spray bin with 1.5% malathion to runoff before storage. Store only clean dry grain. Protect surface with dichlorvos resin strips or pyrethrin spray as recommended for meal moths.
		liquid fumigant[5,6]	3-5 gal. per 1,000 bu.	On surface; repeat if necessary	Clean and spray bin with 1.5% malathion to runoff before storage. Store only clean dry grain. Apply in late July and September in the southern half of Illinois; apply in mid-August in the northern half of Illinois. Protect surface with dichlorvos resin strips or pyrethrin spray as recommended for meal moths.
		methyl bromide + ethylene dibromide[6,7]	As directed	On surface	
		aluminum phosphide[6,8]	180 tablets per 1,000 bu.	Tablets 2 feet apart	

[1] Corn need not be treated if harvested after October 1 unless it is to be carried over the following summer. Wheat and oats should be treated if they are to be held for one month or more in storage after harvest.

[2] Remove webbing before treatment.

[3] Effective only in enclosed bins. Kills adult moths but not the eggs or larvae. Several weeks required to effectively control an existing infestation. Also cleared for use in bins of stored soybeans.

[4] Use only the grade of malathion labeled for use on stored grain. Apply after drying, as malathion vaporizes and is lost rapidly when grain is heat-dried.

[5] Some common liquid fumigants are: carbon bisulfide + carbon tetrachloride, ethylene dichloride + carbon tetrachloride, ethylene dichloride + ethylene dibromide + carbon tetrachloride, etc.

[6] Use with extreme caution. Apply only under calm conditions and when grain temperature is 70° F. or above. Grain should be 8 inches below the lip of the bin and should be leveled before fumigating.

[7] Called the 73 mixture.

[8] Called Phostoxin. Slow vaporization with a 3-day exposure period.

ALFALFA AND CLOVER

Insect	Time of attack	Insecticide[1]	Lb. active ingredient per acre	Placement	Timing of application[2] (See table of limitations, page 11)
Alfalfa weevil (Spring treatment)	March-June	Furadan[3,7]	¼	On foliage	When 25% of the tips are being skeletonized and there are 3 or more larvae per stem treat immediately; two treatments may be necessary on first cutting; regrowth following first cutting may need protection. By ground, use a minimum of 20 gal. of finished spray per acre (10 gal. on stubble) or 4 gal. by air. Do not apply during bloom. Instead cut and remove hay.
		Guthion[3]	½		
		methyl parathion[3]	½		
		Supracide[3]	½		
		malathion[4] plus methoxychlor	¾ ¾		
		diazinon[4] plus methoxychlor (Alfatox)	½ 1		
		Lannate[3]	0.9		
		Imidan	1		
		malathion[5]	1¼		
Clover leaf weevil	March-April	malathion	1	On foliage	When larvae are numerous and damage is noticeable, usually early to mid-April.
Spittlebug	Late April, early May	methoxychlor	¾	On foliage	When bugs begin to hatch and tiny spittle masses are found in crowns of plants.
Aphid	April-May	demeton[3]	¼	On foliage	When aphids are becoming abundant and lady beetle larvae and adults, parasites, and disease are slight.
		diazinon	½		
		malathion	1		
Leafhopper	Early July	Sevin	1	On foliage	When second-growth alfalfa is 4 to 6 inches high, or as needed.
		Cygon	½		
Garden webworm	July-August	Sevin	1	On foliage	When first damage appears. Use toxaphene only on new fall seedlings.
		toxaphene[6]	1½		
		Dylox	1		
Cutworm	April-June	Sevin	1½	On foliage	Cut, remove hay, and spray immediately.
		Dylox	1		
Armyworm	May-June, September	Sevin	1½	On foliage	Only when grasses are abundant.
		malathion	1		
		Dylox	1		
Seed crop insects	July-August	toxaphene[6]	1½	On foliage	No later than 10% bloom.
Grasshopper	June-September	Sevin	¾	On foliage	When grasshoppers are small and before damage is severe. When bees are frequenting bloom, do not apply Sevin. Apply others only late in day.
		diazinon	½		
		malathion	1		
		Dibrom	¾		
Sweet clover weevil	April-May	toxaphene[6]	1½	On foliage	When 50% of foliage has been eaten. New seedlings only.

[1] See page 11 for insecticide restrictions.
[2] Before applying insecticides, be certain to clean all herbicides out of equipment. During pollination, apply very late in day or, if possible, avoid application during bloom.
[3] To be applied only by experienced operators or those wearing protective clothing.
[4] Use no less than these amounts.
[5] Use only when air temperature is above 60° F.
[6] Not for use on dairy farms. Do not apply as foliage sprays or dusts to fields adjacent to dairy pasture, hay, or forage crops.
[7] Only for pure stands of alfalfa. When using no more than ¼ pound per acre, allow 7 days between application and harvest. If you use ¼ to ½ pound per acre, allow 14 days to elapse between application and harvest.

SMALL GRAINS

Insect	Time of attack	Insecticide[1]	Lb. active ingredient per acre	Placement	Timing of application (See table of limitations, page 11)
Grasshopper	June-August	malathion	1	On entire plant	Control early while grasshoppers are small.
		toxaphene[2]	1½		
Armyworm	May-June	malathion	1½	On foliage	When worms are still small and before damage is done. Do not use malathion on barley or trichlorfon on rye.
		toxaphene[2]	1½		
		Dylox	¾		
Greenbug English grain aphid	May-June	Systox[3]	¼	On foliage	When needed.
		ethyl parathion[3]	¼		
Hessian fly	Sept.-October; April-May	Di-Syston	1	In drill row	Use granules in a grass-seeder for susceptible varieties planted early.
		Thimet	1		

[1] See page 11 for insecticide restrictions.
[2] For use on dairy farms only when alternate material is not available and when insect emergency exists. Do not apply as foliage sprays or dusts to or adjacent to dairy pasture, hay, or forage crops.
[3] To be applied only by experienced operators or those wearing protective clothing.

SOYBEANS

Insect	Time of attack	Insecticide[1]	Lb. active ingredient per acre	Placement	Timing of application (See table of limitations, page 11)
Bean leaf beetle	May-June, August	Sevin[2] toxaphene[3]	1 1½	On foliage	When leaf feeding becomes severe, but before plants killed or pods eaten.
Clover root curculio adult	May-June	Sevin[2] toxaphene[3]	1 1½	On marginal rows	When clover is plowed, beetles migrate to adjacent beans.
Grasshopper	June-September	Sevin[2] toxaphene[3]	¾ 1½	On foliage	When migration from adjacent crops begins.
Flea beetle	May-June	Sevin[2] toxaphene[3]	1 1½	On foliage	Seedlings usually attacked. Treat when needed.
Green clover worm and webworm	August	Sevin[3] malathion Lannate[4] Dipel	1 1 ¼ ½	On foliage	When damage occurs between blooming and pod fill. Usually requires 12 or more half-grown worms per foot of row and 15% defoliation to justify treatment.
Mites	June-August	Trithion[4] Dibrom Guthion[4]	¾ 1 ½	On foliage	As needed on field margins and entire field.
Stink bugs	July and August	Sevin[2] malathion	1 1	To foliage	As needed when bugs are numerous; 1 per yard of row may cause damage.
Thrips Leafhoppers	June-August	malathion Sevin[2]	1 ¾	To foliage	As needed.

[1] See page 11 for insecticide restrictions on soybeans.
[2] Sevin should not be used at more than 1 lb. per acre. Higher rates may damage plants.
[3] For use on dairy farms only when alternate material is not available and when insect emergency exists. Do not apply as foliage sprays or dusts to or adjacent to dairy pasture, hay, or forage crops.
[4] To be applied only by experienced operators or those wearing protective clothing.

GRAIN SORGHUM

Insect	Time of attack	Insecticide[1]	Lb. active ingredient per acre	Placement	Timing of application (See table of limitations, page 11)
Webworm	After heads form	Sevin diazinon malathion	1½ ½ 0.9	On grain head	When 10 to 25 percent of the heads are infested with 5 or more larvae per head. Pest usually bad in wet seasons on late planted grain.
Corn earworm	After heads form	Sevin	1½	Direct at head or broadcast	When there is an average of one worm per head.
Midge	August-September	diazinon Sevin	¼ 1½	Direct at head	When 50% of heads have begun to bloom, and there are one or more midge adults per head.
Corn leaf aphids	All season	Cygon malathion	½ 0.9	Broadcast	Under drouth conditions when populations are heavy and damage is apparent.
Greenbug	June-July	ethyl parathion[2] Cygon malathion	¼ ⅓ 1	Broadcast	When greenbug damage is sufficient to cause death of more than 2 normal-sized leaves before the hard-dough stage.

[1] See page 11 for insecticide restrictions.
[2] To be applied only by experienced operators or those wearing protective clothing.

LIMITATIONS IN DAYS BETWEEN APPLICATION OF THE INSECTICIDE AND HARVEST OF THE CROP AND OTHER RESTRICTIONS ON THE USE OF INSECTICIDES FOR FIELD CROP INSECT CONTROL

(Blanks in the table denote that the material is not suggested for that specific use in Illinois)

	Worker re-entry times[a] (hours)	Field corn			Sorghum	Forage crops			
		Seed and soil	Grain	Ensilage and stover		Alfalfa	Clover	Pasture	Seed
Counter (terbufos)[c]	...	A	...	N	...	...	...	...	...
Cygon (dimethoate)	...	...	...	...	28	10,J	...	...	...
Dasanit (fensulfothion)[b]	...	40,A	...	...	...	...	...	...	...
diazinon	...	A	...	10	7	7	7	...	7
Dibrom (naled)	...	...	...	...	...	4	...	0	4
Dyfonate (fonofos)[b]	...	45,A	...	...	...	...	...	...	...
Dylox (trichlorfon)	...	...	40,H	40,H	...	...	...	...	...
ethyl parathion[b]	48	...	...	...	12	...	...	...	...
Furadan (carbofuran)[b]	...	A	...	M	...	7,J	...	...	...
Guthion (azinphosmethyl)[b]	24	...	...	...	...	16,E	16,E	...	...
Imidan (phosmet)	...	...	...	...	...	7,E	...	...	...
Lannate (methomyl)[b]	...	...	...	...	...	7	...	...	...
Lorsban (chlorpyrifos)	...	A	...	...	...	...	...	...	...
malathion	...	...	5	5	7	0	0	0	0
methoxychlor	...	...	...	...	...	7	7	7	...
methyl parathion[b]	48	...	...	...	...	15	15	15	15
Mocap (ethoprop)	...	A	...	...	...	...	...	...	...
Sevin (carbaryl)	...	...	0	0	21,L	0	0	0	...
Supracide[b]	...	...	...	...	...	10,I	...	...	...
Systox (demeton)[b]	48	...	...	...	...	21,E	21,E	...	21,E
Thimet (phorate)	...	A	30,B	30,B	...	...	...	...	...
toxaphene	...	...	A	C	...	...	...	...	D

		Barley		Oats		Rye		Wheat		Soybeans	
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Forage
Dipel (*Bacillus thuringiensis*)	...	...	...	...	...	...	...	...	...	0	0
Di-Syston (disulfoton)	...	...	...	...	...	...	...	...	K	...	...
Dylox (trichlorfon)	...	21	21	21	21	...	...	21	21	...	...
ethyl parathion[b]	48	15	15	...	...	...	...	15	15	...	...
Guthion (azinphosmethyl)[b]	24	...	...	...	...	...	...	...	...	45	D
Lannate (methomyl)[b]	...	...	...	...	...	...	...	...	...	14	3
malathion	...	7	7	7	7	7	7	7	7	3	3
Sevin (carbaryl)	...	...	...	...	...	...	...	...	...	0	0
Systox (demeton)[b]	48	45,F	21,F	45,F	21,F	...	...	45,F	21,F	...	...
Thimet (phorate)	...	...	...	...	...	...	...	...	G	...	...
toxaphene	...	A	D	A	D	A	D	A	D	21	D
Trithion (carbophenothion)[b]	48	...	...	...	...	...	...	...	...	7	D

[a] Workers should be warned in advance of treatments. Workers may not enter fields treated with the insecticides without wearing protective clothing for the intervals indicated. They may not enter a field treated with other insecticides until the spray has dried or the dust has settled without wearing protective clothing. Protective clothing includes a hat, long-sleeved shirt, long-legged pants, and shoes and socks.

[b] Sprays to be applied only by experienced operators wearing proper protective clothing.

[c] Treated fields may be rotated to corn or soybeans without restrictions. Do not rotate treated fields to any other crop for 365 days. Cover crops may be planted in treated fields if plowed under and not grazed.

A. No specific restriction when used as recommended.
B. Besides treatment at planting, one more application can be made at cultivation or over the corn later in the season.
C. Do not feed treated forage to dairy animals. Do not feed sprayed forage or granular-treated corn silage to livestock fattening for slaughter. Do not graze meat animals on granular-treated stover within 28 days of slaughter.
D. Do not graze or feed treated forage to dairy animals or animals being finished for slaughter.
E. Apply only once per cutting.
F. Apply no more than twice per season with at least 14 days between applications.
G. Do not graze treated wheat within 45 days of treatment.
H. Apply only once per season when plants are 3 to 12 inches tall.
I. Make no more than one foliage and one stubble application per cutting.
J. Apply only once per season.
K. Do not graze treated wheat within 30 days of treatment.
L. No time limitation on sorghums used for forage.
M. Do not make a foliar application if Furadan 10 granules were applied at more than 10 pounds per acre at planting. Do not make more than 2 foliar applications per season.
N. When applied in the seed furrow, do not use green fodder or cut for silage prior to 130 days after planting.

References

This circular lists only suggested uses of insecticides for the control of many Illinois field crop pests, and is not designed to discuss other methods of control. Fact sheets discussing nonchemical control methods, descriptions of specific insects, and their life history and biology (designated by NHE numbers) can be obtained from offices of county extension advisers or by writing to Entomology Extension, 169 Natural Resources Building, Urbana, Illinois 61801. The following fact sheets about the insects mentioned in the circular are available:

Alfalfa Weevil — NHE-89
Angoumois Grain Moth — NHE-62
Aphid — NHE-14 and 19
Armyworm — NHE-21
Bean Leaf Beetle — NHE-67
Billbug — NHE-37
Chinch Bug — NHE-35
Clover Leaf Weevil — NHE-12
Clover Root Curculio — NHE-71
Corn Earworm — NHE-33
Corn Leaf Aphid — NHE-29
Corn Rootworm — NHE-26
Cutworm — NHE-38
Fall Armyworm — NHE-34
Flea Beetle — NHE-36
Garden Webworm — NHE-42
Grape Colaspis — NHE-25
Grasshopper — NHE-74
Green Clover Worm — NHE-75
Internal and External Feeders — NHE-64 and 65
Leafhopper — NHE-22
Meal Moths — NHE-63
Sod Webworms — NHE-42
Spittlebug — NHE-13
Sweet Clover Weevil — NHE-15
Thrips — NHE-39
White Grub — NHE-23
Wireworm — NHE-43

The following circulars can be obtained from county extension advisers or by writing to the Office of Publications, College of Agriculture, Urbana, Illinois 61801:

Circular 898, Insect Control for Livestock and Livestock Barns

Circular 900, Insect Control in the Home, Yard, and Garden

These suggestions are revised annually by entomologists of the College of Agriculture and the Illinois Natural History Survey.

Issued in furtherance of Cooperative Extension Work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. JOHN B. CLAAR, Director, Cooperative Extension Service, University of Illinois at Urbana-Champaign. The Illinois Cooperative Extension Service provides equal opportunities in programs and employment.

16M—12-75—32717